中央大學物理學系

Department of Physics, National Central University

Colloquium

Probing the Physics of Living Matter via Single-Molecule and Single-Cell Dynamic Force Spectroscopy

Prof. Ching-Hwa Kiang 江慶華

Department of Physics & Astronomy, Rice University

Date: 2026/03/24 (Tue)
Venue: S4-625
Time: 14:00

Abstract :
At its core, living matter is a convoluted, out-of-equilibrium system governed by complex energy landscapes and nanoscale forces. By probing these physical properties, single-molecule and single-cell dynamic force spectroscopy provide valuable insights into the thermodynamics and dynamics of living systems. Using an atomic force microscope (AFM), we are developing a new label-free method to study a range of living systems, from biomolecular dynamics to complex cellular states, based on their mechanical and acoustic signatures. Our research explores the force responses of systems such as multimeric proteins, DNA, graphene nanoribbons, and mammalian cells, demonstrating the power of force spectroscopy to address complex problems, such as protein folding and cancer diagnosis. Ultimately, this approach establishes nanoscale mechanical signature as a crucial tool for deciphering the physical code of living matter.